

## Tevatron Optics status and plans

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### ◆ Linear optics

- Mismatched beta-functions
  - Injection –  
Beta-functions in sectors are corrected
  - Flat top –  
Looks sufficiently good but minor correction would not hurt
  - Low beta –  
Correction in arcs is required ( $\Delta\beta/\beta > 20\%$ )  
Correction in FF is required
- Coupling is improved but some efforts still are required

### ◆ Non-linear optics

- Large changes in non-linear content of dipoles and quads
  - We pay attention to sextupole terms only  
The compensation is not perfect
- Model predicts chromaticity with ~10 units error
- Non-symmetrical and non-uniform tune shifts due to local three corrector bumps
- During shutdown we prepared four octupole circuits to address the following problems
  - Beam collective stability (head-tail) – two circuits
  - Differential chromaticity – two circuits

### ◆ Beam life time

- Injection
  - Is dominated by interplay of aperture limitations (real aperture and dynamic aperture due to machine non-linearities) and diffusion (gas scattering and IBS)
  - We observed significant improvements of beam lifetime with reducing S6 feed-downs from ~20 A to ~7 A  
There is no detailed simulations coinciding with measurements. The measurements are not perfect as well (not sufficiently detailed)
  - More advanced schemes of non-linear compensation are possible  
But only highly trustable simulation results will invoke us to do a significant change in machine operation

### ◆ Measurements

- Differential orbits
  - Presently manual analysis is only possible
  - Data analysis software is expected to be ready soon
- Turn-by-turn
  - Still does not work
- Tune shifts due to quad change
  - slow and limited number of locations